

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Railroad, Pipeline and Hazardous Materials Investigations

Human Performance and Survival Factors Division

April 28, 2011

HUMAN PERFORMANCE GROUP FACTUAL FINDINGS

Addendum 1

Additional information regarding specific work/rest history was requested of the 9 PG&E employees previously interviewed by the Human Performance group.

A. ACCIDENT

The rupture and explosion of natural gas line 132 owned and operated by Pacific Gas and Electric Company (PG&E) at about 6:11 p.m.¹ on September 9, 2010 in San Bruno, California.

NTSB accident number: DCA-10-MP-008

B. HUMAN PERFORMANCE GROUP

Lawson F. Narvell, Jr.
Human Performance Investigator
NTSB
490 L'Enfant Plaza East, S.W.
Washington, D.C. 20594
Tel: (202) 314-6422 Cell: (202) 320-6317
Fax: (202) 314-6482 Email: narvelr@ntsb.gov

Edward Stracke
Pipeline Engineering Manager
PG&E
375 N. Wiget Lane
Walnut Creek, CA 94518
Tel: (925) 974-4106 Cell: (925) 788-6755
Fax: (925) 974-4102 Email: eas4@pg&e.com

C. DETAILS OF THE ACCIDENT

1. Additional work/rest information

¹ Unless otherwise indicated, all times are denoted in Pacific Daylight Time.

The following information was provided in writing by 9 PG&E employees previously interviewed by the Human Performance group. Specific written questions were provided to them via the Human Performance group member in late March 2011 and all responses were received by April 25, 2011. The sequence of employees and their respective titles is consistent with those that appear in the Human Performance factual dated February 2, 2011. Their responses to those questions appear below.

(1). A gas control technician (GCT) on duty at the Milpitas terminal at time of the accident. The GCT said that on his regular day off he retires between 8:00 p.m. and 9:00 p.m., watches television, and tries to get to sleep by 10:00 p.m. He said he awakens the following mornings between 5:30 a.m. and 6:00 a.m. On days that he works he tries to be in bed by 9:00 p.m., asleep by 10:00 p.m., awakens the following morning at 4:45 a.m. and reports for duty at 6:00 a.m.

The GCT reported that he is normally a sound sleeper and sleeps throughout the night, and did not recall awaking during the night for the 4 days prior to the accident. He said the only difference in his sleep pattern the 4 days before the accident was on September 7 when he awoke at 3:15 a.m. to report to work by 6:00 a.m., adding he obtained 7 hours of sleep prior to awakening. The GCT recalled taking no naps during this same 4 day period. The GCT also said that there were no factors in his environment (e.g., light, noise, phone calls, etc.) that interfered with his ability to sleep during this period. He also said he did not have difficulty falling or staying asleep during this period.

The GCT said he had never discussed problems sleeping with a physician, nor did he have any medical issues that affected his sleep. Finally, he said he had not received any fatigue management training from PG&E.

(2). An apprentice gas technician (AGT) on duty at the Milpitas terminal at the time of the accident. The AGT said that on his days off he normally retired the evening before at about 11:00 p.m. and arose about 8:30 a.m. the following morning. On the days he works he usually retires about 10:00 p.m. and awakens at 5:30 a.m. Therefore, on those days he obtains between 7 and 8 hours of sleep.

The AGT said that for the 4 days before the accident he slept well, and added his sleep pattern was not different or disrupted during that same period. He also said he took no naps during this period. The AGT said there were no factors in his environment (e.g., light, noise, phone calls, etc.) that interfered with his ability to sleep during the 4 days before the accident, and that he experience no difficulty in falling or staying asleep during this period. The AGT indicated he had never discussed problems with sleeping with a physician, nor did he have any medical issues that affected his sleep. Finally, the AGT said that he had never received any fatigue management training from PG&E.

(3). A technical sub foreman (TSF) on duty at the Milpitas terminal at the time of the accident. The TSF said he typically retired each evening at about 10:00 p.m. and arose about 7:00 a.m. the following morning. He said he could not remember having been disturbed from his sleep the night before the accident, or being sleep deprived. The TSF said his sleep pattern was not different or disrupted during the 4 days before the accident. There were no disruptive factors (e.g., light, noise, phone calls, etc.) that interfered with his ability to sleep during the 4 days before the accident. Furthermore, he took no naps during this same period. The TSF did not recall having

difficulty falling or staying asleep during this same period. He also said he did not have any medical concerns or issues, including a sleep disorder, before the accident. Finally, he said he had not received any fatigue management training from PG&E.

(4). A PG&E contractor on duty at the Milpitas terminal at the time of the accident. The contractor said he typically retired for the evening about 11:30 p.m. and awoke about 7:30 a.m. the following day, thereby obtaining about 8 hours of sleep. He was unable to provide information about the quality of his sleep for the 4 days before the accident, and said he normally awakens around 5:00 a.m. to use the bathroom and then returns to sleep. The contractor said that his sleep pattern for this same time period was not different or disrupted, nor did he recall taking any naps during this period. The contractor said there were no factors in his environment (e.g., noise, light, phone calls, etc.) that interfered with his ability to sleep for the 4 days leading up to the accident. He added that he did not have difficulty falling or staying asleep during that time, and that he was "...a pretty sound sleeper." He said that at no point had he discussed problems with obtaining adequate rest with a physician, did not have a sleeping disorder, and had no medical concerns that affected his sleep. Finally, the contractor said he was not able to recall having received any fatigue management training from PG&E.

(5). A gas transmission coordinator (GTC) on duty at the Supervisory Control and Data Acquisition (SCADA) center in San Francisco, California. The GTC said that on his days off he typically obtained between 8 to 10 hours of sleep. He recalled that the quality of his sleep for the 4 days before the accident was good. He was unable to recall whether he awoke in the middle of the night during that time period. The GTC also said that during that time period there were no differences or disruptions to his sleep pattern. He could not recall taking any naps during this period. The GTC said there were no factors in his environment (e.g., noise, light, phone calls, etc.) that interfered with his ability to sleep for the 4 days leading up to the accident. He added that he did not have difficulty falling or staying asleep during that same period. The GTC said that at no time had he discussed problems related to sleep with a physician, nor did he have any medical issues that affected his sleep. Finally, the GTC recalled that as a shift worker he once viewed a video about fatigue and sleep.

(6). A senior GTC (SGTC) on duty at the SCADA center in San Francisco, California. The SGTC said that when he works the dayshift he normally retires for the evening at about 9:30 p.m., or sometimes as early as 8:30 p.m. or 8:45 p.m. and awakens between 4:00 a.m. and 4:15 a.m. the following morning. When on the nightshift, he awakens naturally between 7:30 a.m. and 9:00 a.m. He subsequently takes a nap² in a darkened, quiet temperature controlled room between 11:30 a.m. and 1:30 p.m., sleeps until about 4:00 p.m., and then reports for duty at 6:00 p.m. Once he goes off duty the following day at 6:00 a.m. he goes directly to bed upon arriving home at about 7:30 a.m.

The SGTC was unable to specifically provide information pertaining to the quality of his sleep for several days prior to the accident, and added there was nothing memorable about those days that would have caused him to take note. He further said it was likely he awoke to urinate, and thus would have been awake for about 5 minutes before returning to sleep. The SGTC said there were no differences in his sleep pattern for the 4 days before the accident. He also said there was

² The SGTC recalled that his most recent nap before the accident would have occurred on the Monday morning the week of the accident (September 6) after his last nightshift, and would not have exceeded 2 hours.

nothing in his environment (e.g., light, noise, phone calls, etc.) that would have interfered with his ability to sleep, and added that after 25 plus years of working shift work he had learned the value of taking charge of his environment. The SGTC said that during the 4 days up to and including the accident he had no difficulty falling or staying asleep. While he had no medical concerns or issues that affected his sleep, the SGTC said that his wife identified him as likely having sleep apnea. A subsequent sleep study confirmed the presence of sleep apnea.³ The SGTC said that PG&E had in the past provided sleep seminars that were directed towards shift workers, and that he routinely receives newsletters that contain fatigue management information. Finally, he said that PG&E provided a reclining chair for napping that was segregated from the workplace in an area whereby lighting can be independently controlled.

(7). A gas system operator (GSO) on duty at the SCADA center in San Francisco, California. When asked to describe his typical sleep pattern, the GSO responded this was dependent on his days off between shifts. Specifically, he said he regularly transitions from nightshifts to dayshifts. He added, "It seems I'm always trying to turn my body clock around to prepare for my next set of shifts." He said that when he works a set of shifts he obtains about 5 to 6 hours of sleep, and when he is off work he obtains about 8 to 9 hours of sleep, although none of his rest was deep sleep. When asked to characterize the quality of his sleep for the 4 days before the accident, the GSO said that it can take anywhere from 1 to 2 hours to fall asleep unless he took prescribed sleeping pills.⁴ He added he arose at least once during the night to use the bathroom. The GSO said that his sleep pattern was not different or disrupted for the 4 days before the accident, and added he took no naps during this same time period. He said there were no factors in his environment (e.g., light, noise, phone calls, etc.) that interfered with his ability to sleep for the 4 days before the accident.

When asked if he had discussed problems sleeping with a physician, the GSO said his doctor was aware of his sleep patterns, which he attributed to rotating 12 hour shift work. He added that his commute time is 3 hours, which means a total of 15 hours work and commuting time. He said that his insomnia is due to a "very disruptive sleep pattern due to shift work." Finally, the GSO said that he had attended 2 shift worker seminars over the previous 10 years.

(8). A GSO on duty at the SCADA center in San Francisco, California. The GSO said the he typically went to bed at 11:00 p.m. and awoke at 7:00 a.m. on his days off. The night prior to working a day shift he would normally retire between 9:30 p.m. and 10:00 p.m. and awaken at 4:00 a.m. and thus obtain between 6 and 6 and one half hours of sleep. The GSO said that although he was unable to accurately characterize the quality of his sleep for the 4 days prior to the accident, he said he believed that the quality of his sleep was good, and added that it wasn't unusual for him to awake during the night to use the bathroom. This normally did not have an adverse effect on his sleep. The GSO said he could not specifically recall taking any naps during the 4 days before the accident, although while commuting to work by train it was not unusual for him to doze for between 15 and 30 minutes, especially during the commute home after work.

The GSO said there were no factors in his environment (e.g., light, noise, phone calls, etc.) that interfered with his ability to sleep for the 4 days before the accident, nor could he recall having difficulty falling or staying asleep during this period.

³ The SGTC stated he now sleeps well with the use of a continuous positive airway pressure (CPAP) machine, a device typically prescribed for individuals diagnosed with obstructive sleep apnea.

⁴ The GSO said he did not take these sleeping aids the week before the accident.

The GSO said that about 3 years before the accident he discussed his sleep habits with a physician. Specifically, he said that after working 3 or 4 consecutive night shifts he sometimes had difficulty sleeping through the following night or two. He added that while he had not been diagnosed with a sleep disorder, he was prescribed 10 mg of Ambien at that time. The GSO said he never took Ambien before beginning a night shift, but only when completing a set of consecutive night shift work. He said he was certain he did not take this medication for the 4 days prior to the accident. He also said that he had no medical issues that affect his sleep. When queried as to whether he received fatigue management training at PG&E, the GSO said that he received monthly newsletters from Circadian 24/7 Workforce Solutions⁵ that contained information concerning shift work and how to best minimize the negative impacts of fatigue, both at work and home.

(9). A Measurement and Control GSO (GSOMC) on duty at the SCADA center in San Francisco, California. The GSOMC said that on his days off he was normally in bed by 9:30 p.m. and awoke the following day between 7:00 a.m. and 8:00 a.m. On days that he works, he typically retires between 8:30 p.m. and 9:30 p.m. and awakens the following day between 4:00 a.m. and 4:30 a.m. When he works night shifts, he will try and take a 2 hour nap between 2:00 p.m. and 4:00 p.m. before reporting for his shift that begins at 6:00 p.m. and ends the following morning at 6:00 a.m. Once he completes his night shift work he returns home, is in bed by 7:30 a.m. and arises anywhere between 11:00 a.m. and 3:00 p.m. He said that the week of the accident he was working day shift.

The GSOMC said he usually sleeps good and had no problems sleeping the week before the accident, and added he had no problems falling or staying asleep. He also said that his sleep pattern was not disrupted or different during this period. He further said that there were no factors in his environment (e.g. light, noise, phone calls, etc.) that interfered with his ability to sleep.

The GSOMC said that he had never discussed his sleep with a physician in terms of a potential problem, and had no medical issues that affected his sleep. Finally, he said that PG&E had provided articles pertaining to fatigue, and believed there may have been a seminar about fatigue many years ago, (no further information).

D. CONCLUSION

The information in this addendum will be evaluated in the context of previously obtained information regarding the work/rest activities of 9 PG&E employees. Their entire work/rest information will be addressed and assessed in a forthcoming analysis.

Compiled by: /s/
Lawson F. Narvell, Jr.
Human Performance Investigator

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Approved by: /s/
Bob Beaton, Ph.D.
Chief, Human Performance and Survival Factors Division (RPH-40)

Date: April 28, 2011

⁵ This company provides workforce performance and safety solutions for businesses that operate around the clock.